Appendix H

Estimating and Presenting Power Sector Fuel Use in EIA Publications and Analyses

Preface

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I. Background

The Energy Information Administration (EIA) has comprehensively reviewed and revised how it collects, estimates, and reports fuel use for facilities producing electricity. The review addressed inconsistent reporting of the fuels used for electric power and changes in the electric power marketplace that have been inconsistently represented in various EIA survey forms and publications. For example:

- In some cases fuel use by combined-heat-and-power (CHP) plants[1] has been reported as industrial sector fuel use, while in other cases it has been reported as electric power sector fuel use.

- Electricity generation and fuel consumption have been categorized and reported in several different ways, such as (1) utility only; (2) utility and independent power producers; or (3) utility, independent power producers, and CHP plants. The restructuring of the power industry is making some of these categories less meaningful.

The goal of EIA's comprehensive review was to improve the quality and consistency of its electric power data throughout all data and analysis products. Because power facilities operate in all sectors of the economy (e.g., in commercial buildings, such as hospitals and college campuses, and industrial facilities, such as paper mills and refineries) and use many fuels, any change to electric power data affects data series in nearly all fuel areas and causes changes in a wide variety of EIA publications.

As a result of the comprehensive review, EIA has made the following changes:

- EIA has adjusted all presentations of data on electric power to a consistent format and defined the electric power sector to include electricity-only and CHP plants whose primary business is to sell electricity, or electricity and heat, to the public.
- EIA is providing detail within the electric power sector, commercial sector, and industrial sector on fuel used by CHP plants in those sectors.
- EIA has changed the sources of data on fuel used by components of the electric power sector. All tabulations and publications will use data obtained from EIA's surveys of electric power generators. This change in data source contributes to changes in total fuel consumption of natural gas.
- EIA has revised its historical data on electric power to resolve data anomalies. The revisions contribute to changes in EIA's electricity series as well as the fuel-use series.

[1] Combined-heat-and-power plants (CHP) produce both electricity and useful thermal output. EIA formerly referred to these plants as cogenerators, but has determined that CHP better describes the facilities because some of the plants included in EIA's data do not produce heat and power in a sequential fashion, and as a result do not meet the legal definition of cogeneration specified in the Public Utilities Regulatory Policies Act (PURPA).

This document provides detail on these changes and describes the reasoning behind the changes and their effects on EIA forms and publications. The *Annual Energy Review (AER) 2001* is the first of the annual publications to be released with the new formats. In the upcoming months, EIA will be releasing other annual publications, followed by the monthly publications. The remainder of this document is organized as follows:

- Section II provides an overview of the key changes.
- Section III discusses the impacts on multi-fuel publications.[2]
- Sections IV through VIII provide specific information for electric power, natural gas, coal, petroleum, and renewable energy surveys and publications, respectively. Although the changes have not yet been implemented in these publications, they are reflected in *AER 2001* for these topics.
- Section IX provides information on the estimation of greenhouse gas emissions. These data do not appear in the *AER 2001*, but are based on data in it. Data on greenhouse gas emissions will appear in the upcoming EIA publication, *Emissions of Greenhouse Gases in the United States*.

II. Overview of Key Changes

The many changes that will occur because of the fuel review generally fall into three broad categories: (1) the categorization of electric power facilities, (2) the reporting of combined-heat-and-power plant fuel use, and (3) data series revisions resulting from revised electric power fuel use estimates. Each of these areas is discussed below.

Categorization of Electric Power Facilities

Until the 1990s, most electric power generation and fuel use data could be meaningfully categorized into electric utilities and nonutility power producers.[3] Electric utilities were generally structured as vertically integrated[4] power companies that were responsible for generating, transmitting, and distributing power to consumers within their franchised service territory. Nonutility power producers were generally independent generators—mostly combined-heat-and-power plants—that produced some power for their own use and sold the remainder to utilities for distribution to consumers. However, in recent years, many formerly integrated utilities have split apart, spinning off the generating part of their business into separate companies. Independent developers have built most of the new generating capacity that has been installed in recent years. As a result, the distinction between utility and nonutility power plants has become much less meaningful. In fact, a large portion of the growth in nonutility generation in recent years is due to the reclassification of utility power plants as nonutility power plants.

[2] Multi-fuel publications are those that provide information on multiple fuels and sectors, such as the *Monthly Energy Review* and the *Annual Energy Review*.
[3] For an example of this, see *Electric Power Annual 1998, Volume II*, DOE/EIA-0348(98)/2, December 1999.
[4] In this context "integrated" means that the company is involved in the three main sectors of the electric power business—generation, transmission, and distribution.

To reflect the changing industry structure, EIA is now organizing electric power generation and fuel use data into two new categories: electricity-only and combined-heat-and-power (CHP) plants. These categories separate power plants by function; i.e., power only or power plus thermal, rather than by ownership class.

Electricity-only plants represent all plants, whether owned by utilities or nonutilities that produce only electricity. CHP plants represent entities that produce both electricity and some form of thermal energy. Both categories will have some facilities that are owned by traditional utilities and independent companies.

In addition, EIA is now presenting data for an electric power sector that includes electricity-only plants and CHP plants whose primary business is to sell electricity, or electricity and heat, to the public (North American Industry Classification System code 22). This contrasts with some previous data presentations in which the electric power sector included industrial and commercial CHP plants as well (Figure H1).

Figure H1. Electric Power Sector in AER 2001 and AER 2000

In some tables and publications, the electric power sector will continue to be broken down into electric utilities and independent power producers for customers who have expressed an interest in this breakout. For example, Table 8.1 of *AER 2001* presents an electricity overview and shows data on net generation for electric utilities and independent power producers separately. It is the only table in *AER 2001* that has this break-out (Figure H2).

Figure H2. Electric Utilities and Independent Power Producers are shown separately in Electricity Overview

Table 8.1 Electricity Overview, 1949-2001
(Billion Kilowatthours)

Year	Net Generation					
	Electric Power Sector [1]			Commercial Sector [2]	Industrial Sector [3]	Total
	Electric Utilities	Independent Power Producers	Total			

[1] The electric power sector (electric utilities and independent power producers) comprises electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public—i.e., NAICS 22 plants. Due to the restructuring of the electric power sector, the sale of generation assets is resulting in a reclassification of plants from electric utilities to independent power producers.

Reporting of CHP Facility Fuel Use

Historically, fuel consumption in CHP plants has been combined with other uses in many EIA publications. For example, in some tables the use of natural gas in commercial and industrial CHP plants was included with other commercial and industrial uses. Further, some of the fuel consumption (the portion associated with electricity production) at these same facilities was also reported under the column labeled "Nonutility Power Producers." Based on questions received, it became clear that this categorization led to confusion for many EIA customers.

In the future, EIA will distinguish within the industrial, commercial, and electric power sectors what portion of fuel consumption is used in CHP facilities and non-CHP facilities. For example:

- In tabulations of energy use by economic sector, if a commercial or industrial facility has a CHP unit, the total fuel consumption for that unit will be reported under commercial or industrial, but it will be identified separately from other commercial or industrial consumption. Figure H3 provides an example for natural gas consumption in the industrial sector. It shows the headings in Table 6.5 of *AER 2001* compared with the headings for the same table in *AER 2000*.

Figure H3. Industrial Sector for Natural Gas in AER 2001 and AER 2000

AER 2001

End-Use Sectors				
Industrial				
Lease and Plant Fuel	Other Industrial			Total
	CHP [5]	Non-CHP [6]	Total	

AER 2000

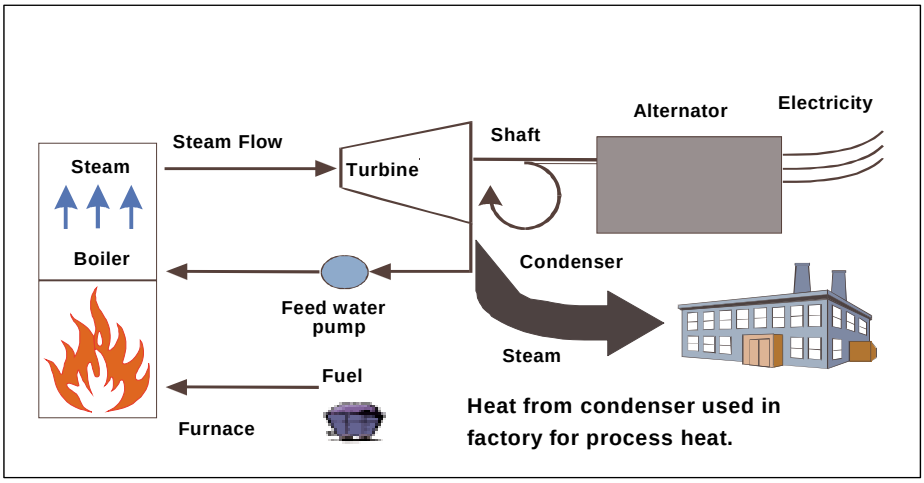
End-Use Sectors		
Industrial [2]		
Delivered to Industrial Facilities	Lease and Plant Fuel	Total

CHP plants that report their primary business is generating and selling power to others will be reported in a separate column in the electric power sector, as shown in Figure H1.

- In tabulations of energy use to produce electric power, the total fuel consumption reported by CHP plants will be further separated into that which is used to produce electricity and that which is used to produce thermal energy.[5] See Tables 8.3b,c, and d of *AER 2001*. Figure H4 shows a schematic for combined heat and power producers.

[5] For the method used to separate the fuel used at CHP plants between electricity and useful thermal energy production, see Section IV.

Figure H4. Schematic for Combined Heat and Power Plants



The separation between electricity and thermal uses is being done because many EIA data users have expressed interest in knowing how much fuel is used to produce electricity in the United States.

Data Series Revisions Resulting From Changes in Electric Power Fuel Use Estimates

The revisions to electric power data affect many areas. For example, historically, to estimate natural gas use, EIA surveyed natural gas pipeline-companies and local gas utilities to obtain data on natural gas used by residential, commercial, industrial, and electric utility sectors, and nonutility generators.[6] However, EIA also surveyed electric utilities on their natural gas use. These data obtained directly from the end user were generally thought to be more accurate than the data obtained from natural gas suppliers. As a result, total natural gas use was estimated by adding together the data from natural gas companies on residential, commercial, industrial, and nonutility power producer use to the amount reported directly by electric utilities. The data collected for nonutility power producers were included with industrial use in previous EIA natural gas publications.

With the changing structure of the electricity sector, this reporting approach no longer appears reasonable. EIA has decided to follow the procedure described for electric utilities and use data obtained from its direct surveys of nonutility electric generators rather than the natural gas

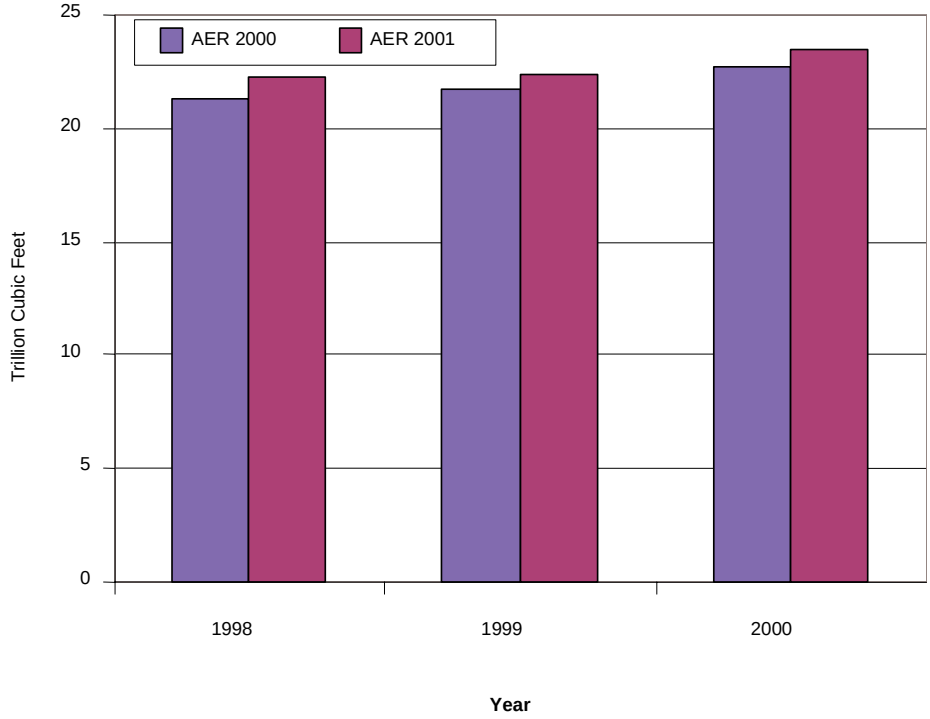
[6] Energy Information Administration, Form EIA-176, "Annual Report of Natural and Supplemental Gas Supply and Disposition."

supplier surveys.[7] More detail on how the various fuel sectors are affected is given in the following sections.

Data changes are also occurring because of the extensive review of reported data that was undertaken in this process. Since it was decided that data reported directly by utilities and nonutility power generators would be the primary source of fuel consumption data for the power sector, an examination of heat rates,[8] capacity factors,[9] and power-to-steam ratios across 12 years of reported data was conducted. As a result, data for nonutility power producers for 1989 through 2000 have been revised. The data review procedure is described in Section IV under the heading "Efforts to Improve Data." As a result of the review by expert EIA analysts, anomalous values have been investigated and resolved and the result is higher quality data at aggregated levels.

Revisions resulting from changing the source of fuel consumption data for nonutilities and from EIA's data review affect data beyond the category of nonutilities. For example, the revised estimate of natural gas consumption for 2000 is 3 percent higher (.75 trillion cubic feet) in the *Annual Energy Review (AER) 2001* than in *AER 2000* (Table H1 and Figure H5).

Figure H5. Impact of Revisions to Total Natural Gas Consumption



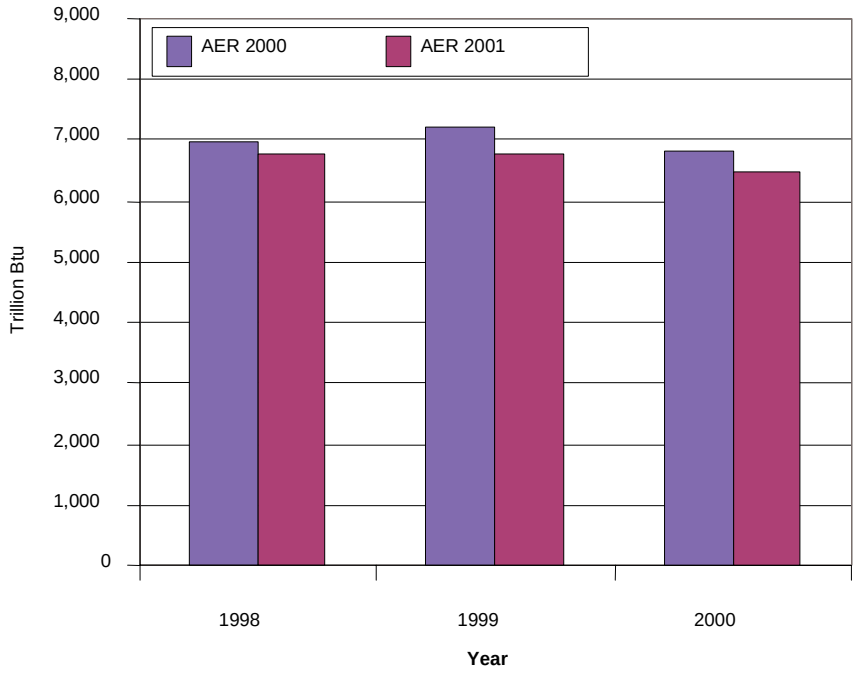
[7] Energy Information Administration, Form EIA-759, "Monthly Power Plant Report" for electric utilities and Forms EIA-867 and EIA-860B, "Annual Electric Generator Report–Nonutility" for nonutilities. Starting with 2001, data for both utilities and nonutilities are collected on a new survey, Form EIA-906, "Power Plant Report."

[8] Heat rates are computed by dividing the heat content of the fuel burned to generate electricity by the resulting net kilowatthour generation.

[9] Capacity factors are the ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full power operation during the same period.

On the other hand, the revised estimate of renewable energy consumption for 2000 is 5 percent lower in *AER 2001* than in *AER 2000* (Figure H6), due largely to a downward revision in the estimate of biomass energy consumption particularly wood/wood waste at electric power plants. A smaller revision resulted from the procedure to assign fuel consumption by energy type at some solar and hydroelectric plants. In *AER 2001*, the assignment was made at the boiler level while in *AER 2000* it was based on aggregate plant-level information.

Figure H6. Impact of Revisions to Total Renewable Energy Consumption



Estimates for petroleum and coal consumption show little change between the 2000 and 2001 *AERs* for the same year. This is also true for electricity net generation.

Table H1. Revisions to Selected Estimates: AER 2001 and AER 2000

Electricity Net Generation: Total (All Sectors)
(Billion Kilowatthours)

Year	AER 2000	AER 2001	Percent Difference
1998	3,618	3,620	0.1
1999	3,706	3,695	-0.3
2000	3,792	3,802	0.3

Total Natural Gas Consumption
(Trillion Cubic feet)

Year	AER 2000	AER 2001	Percent Difference
1998	21.26	22.24	4.6
1999	21.70	22.40	3.2
2000	22.71	23.46	3.3

Total Coal Consumption
(Million Short Tons)

Year	AER 2000	AER 2001	Percent Difference
1998	1,038.3	1,037.1	-0.1
1999	1,045.3	1,038.6	-0.6
2000	1,079.7	1,084.1	0.4

Total Petroleum Consumption
(Million Barrels Per Day)

Year	AER 2000	AER 2001	Percent Difference
1998	18.92	18.92	0.0
1999	19.52	19.52	0.0
2000	19.48	19.70	1.1

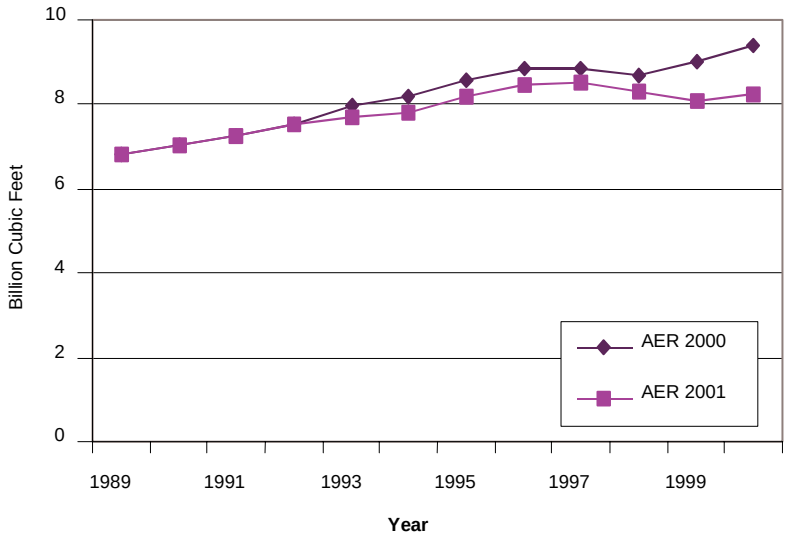
Total Renewable Energy Consumption
(Trillion Btu)

Year	AER 2000	AER 2001	Percent Difference
1998	6,977	6,782	-2.8
1999	7,226	6,790	-6.0
2000	6,823	6,465	-5.2

Sources: Electricity Net Generation, Table 8.1 of *AER 2000* and *AER 2001*. Natural Gas, Consumption, Table 6.5 of *AER 2000* and *AER 2001*. Coal Consumption, Table 6.5 of *AER 2000* and *AER 2001*. Petroleum Consumption, Table 5.12 of *AER 2000* and *AER 2001*. Renewable Energy Consumption, Table 10.2b of *AER 2000* and *AER 2001*.

In addition, as a result of the recategorization of nonutility data, estimates of industrial natural gas consumption have been revised and are lower. For example, in *AER 2000* EIA showed 9.39 trillion cubic feet delivered to industrial facilities in 2000. In *AER 2001* the comparable figure (under the "other industrial" heading) for 2000 is 8.25 trillion cubic feet (Figure H7). This change is a result of the change in the operational definition of deliveries to the industrial sector, which is explained in Section V.

Figure H7. Industrial Natural Gas Consumption: AER 2001 and AER 2000



Note: AER 2000 Industrial equals "Deliveries to Industrial Facilities".
AER 2001 Industrial equals "Other Industrial Total".

Because the natural gas consumption table in the AER best illustrates the changes that have been made, Table 6.5 of *AER 2001* and *AER 2000* are presented here for comparison.

http://www.eia.doe.gov/emeu/aer/txt/ptb0605.html
http://www.eia.doe.gov/emeu/aer/txt/tab0605.html

To summarize the changes, data for combined-heat-and-power plants are shown separately by end-use sector in *AER 2001* while they are included with the sector totals for *AER 2000*. Independent power producers are excluded from the industrial sector in *AER 2001* and included in the electric power sector. Data are based on a survey of electric generators. By contrast, independent power producers were included in the industrial sector in *AER 2000* and data were based on a survey of natural gas suppliers.

III. Multi-Fuel Publications

EIA's multi-fuel publications—i.e., those that report data on numerous energy sources and provide overall energy totals—will be reformatted to incorporate the new approach described in detail in the preceding sections. The *Annual Energy Review 2001* is the first of the historical multi-fuel publications to be released with the new formats. In the months ahead, EIA will undertake the redesign of the *Monthly Energy Review* (MER) to make its data and presentations conform to the new AER. In addition to the MER, the State-level consumption, price, and expenditure estimates that have previously been released under the titles *State Energy Data*

Report and *State Energy Price and Expenditure Report* will be reformatted beginning with the 2001 update; the 2000 updates are now in final processing and will not conform to the new AER formats. Coordinated data and presentation changes will also be incorporated into EIA's forecast products—the *Short-Term Energy Outlook* (STEO) and the *Annual Energy Outlook* (AEO).

The *Annual Energy Review 2*001 (*AER 2001*) includes many redesigned tables (and related graphs) that were adapted to present the new electricity data. Revised tables fall into three groupings: electricity, fuels, and total energy. These tables are interrelated.

Table 8.3e provides data on fuel consumption for both electricity generation and useful thermal output. Data on consumption by the electric power sector on Table 8.3e correspond with data for this sector on fuel consumption tables (e.g., Table 6.5 on natural gas, Table 7.3 on coal, and Table 10.2b on renewable energy consumption). See Figure H8 for natural gas.

Figure H 8. Consumption of Natural Gas in Electric Power Sector: AER Table 8.3e and Table 6.5

Fossil Fuel Portion of Table 8.3e for Electric Power Sector: AER 2001

Year	Fossil Fuels					
	Coal [1]	Distillate Fuel Oil	Residual Fuel Oil	Other Liquids [2]	Petroleum Coke	Natural Gas [3]
	Thousand Short Tons	Thousand Barrels			Thousand Short Tons	Billion Cubic Feet
	Electric Power Sector (Electric Utilities and Independent Power Produce					
1989P	772,190	9 26,156	10 244,179	10	517	3,105
1990P	780,987	9 16,400	10 183,375	26	983	3,234
1991P	783,874	9 14,359	10 172,625	59	974	3,316
1992P	795,094	9 12,623	10 138,726	128	1,494	3,448
1993P	831,645	9 14,849	10 152,481	239	2,611	3,473
1994P	838,354	9 20,612	10 136,222	771	2,315	3,903
1995P	850,230	9 18,553	10 90,023	499	2,674	4,237
1996P	896,921	9 18,780	10 99,951	653	2,642	3,807
1997P	921,364	9 18,989	10 113,669	152	3,372	4,065
1998P	936,619	9 23,300	10 166,528	431	4,102	4,588
1999P	940,922	9 24,058	10 152,493	544	3,735	4,820
2000P	985,821	9 30,016	10 136,513	454	3,275	5,206
2001P	966,739	9 30,849	10 157,486	397	3,660	5,261

Electric Power Sector Portion of Table 6.5 for AER 2001

Table 6.5 Natural Gas Consumption by Sector, 1949-2001
(Trillion Cubic Feet)

Year	Electric Power Sector [1,2]		
	Electricity Only	CHP	Total
1989	2,11,P 2.79	10,11,P 0.31	2,11,P 3.11
1990	11,P 2.79	10,11,P 0.44	11,P 3.23
1991	11,P 2.82	10,11,P 0.49	11,P 3.32
1992	11,P 2.83	10,11,P 0.62	11,P 3.45
1993	P 2.76	10,P 0.72	P 3.47
1994	P 3.06	10,P 0.84	P 3.90
1995	P 3.29	10,P 0.95	P 4.24
1996	P 2.82	10,P 0.98	P 3.81
1997	P 3.04	10,P 1.03	P 4.06
1998	P 3.54	10,P 1.04	P 4.59
1999	P 3.73	10,P 1.09	P 4.82
2000	P 4.09	10,P 1.11	P 5.21
2001	P 4.08	10,E 1.18	P 5.26

Table 8.3e Consumption of Combustible Fuels for Electricity Generation and Useful Thermal Output at Electricity-Only and Combined-Heat-and-Power Plants by Sector, 1989-2001

Similarly, data on commercial sector CHP plants on Table 8.3e correspond with the commercial sector CHP columns of the fuel consumption tables and data on industrial sector CHP plants on Table 8.3e correspond with the industrial sector CHP columns of the fuel consumption tables.

Table 8.3a provides data on consumption of combustible fuels for electricity generation. Data on the amount of fossil fuel (such as coal, residual fuel oil, and natural gas) and on the amount of renewable energy used to generate electricity at both electricity-only and combined-heat-and-power (CHP) plants can be found on this table.

Table 8.3a data on fuel consumed for electricity generation differ from those for the electric power sector on the fuel consumption tables (e.g., Table 6.5 for natural gas) because the electric power sector includes entities that produce thermal energy as well as electricity (CHP plants whose primary business is to sell electricity). In addition, there are entities that generate electricity that are not in the electric power sector (commercial sector CHP plants and industrial sector CHP plants). Table 8.3d provides data on consumption for useful thermal output at CHP plants.

Electricity Tables. Most AER 2000 electricity tables were altered in format for presentation in the *AER 2001*. This crosswalk provides the relationship from each *AER 2000* table to its closest match in the *AER 2001*:

AER 2000	AER 2001	Title in the AER 2001
8.1	8.1	Electricity Overview
8.2	8.2a	Electricity Net Generation: Total (All Sectors)
8.3	8.2b	Electricity Net Generation at Electricity-Only Plants: Electric Power Sector
8.4	8.2c	Electricity Net Generation at Combined-Heat-and-Power Plants by Sector
---	8.2d	Useful Thermal Output at Combined-Heat- and-Power-Plants by Sector
8.8	8.3a	Consumption of Combustible Fuels for Electricity Generation: Total (All Sectors)
8.9	8.3b	Consumption of Combustible Fuels for Electricity Generation at Electricity-Only Plants: Electric Power Sector
8.10	8.3c	Estimated Consumption of Combustible Fuels for Electricity Generation at Combined-Heat- and-Power-Plants by Sector
---	8.3d	Estimated Consumption of Combustible Fuels for Useful Thermal Output at Combined-Heat-and-Power Plants by Sector
---	8.3e	Consumption of Combustible Fuels for Electricity Generation and Useful Thermal Output at Electricity-Only and Combined-Heat-and-Power Plants by Sector
8.11	8.4	Stocks of Coal and Petroleum: Electric Power Sector
8.12	8.5	Electricity End Use
8.15	8.6	Average Retail Prices of Electricity
8.5	8.7a	Electric Net Summer Capacity: Total (All Sectors)
8.6	8.7b	Electric Net Summer Capacity at Electricity-Only Power Plants: Electric Power Sector
8.7	8.7c	Electric Net Summer Capacity at Combined-Heat-and-Power Plants by Sector
8.14	8.8	Electric Noncoincident Peak Load and Capacity Margin

8.13 8.9 Electric Utility Demand-Side Management Programs

Fuel Tables. The following *AER 2001* fuel tables were reformatted from the previous year's report to incorporate the new electricity information:

5.12a Petroleum Consumption: Residential and Commercial Sectors
5.12b Petroleum Consumption: Industrial Sector
5.12d Petroleum Consumption: Electric Power Sector
5.13 Oil and Kerosene Adjusted Sales
6.5 Natural Gas Consumption by Sector
7.3 Coal Consumption by Sector
7.5 Coal Stocks by Sector
10.2a Renewable Energy Consumption: End-Use Sectors
10.2b Renewable Energy Consumption: Electric Power Sector, Electricity Trade, and Total
12.2 Carbon Dioxide Emissions From Energy Consumption by Sector
12.3 Carbon Dioxide Emissions From Energy Consumption by Sector by Energy Source
12.7 Emissions From Electricity Generation
A3 Approximate Heat Content of Petroleum Product Weighted Averages
A4 Approximate Heat Content of Natural Gas
A5 Approximate Heat Content of Coal and Coal Coke

Total Energy Tables. The following *AER 2001* tables summarize all energy consumption and include format changes that are related to the new electricity information:

2.1a Energy Consumption by Sector
2.1c Commercial Energy Consumption Sector
2.1d Industrial Energy Consumption Sector
2.1f Electric Power Sector Energy Consumption
AER 2000 Table 2.1f is replaced in the *AER 2001* with:
2.2a Energy Consumption for Electricity Generation: Total (All Sectors)
2.2b Energy Consumption for Electricity Generation: Electric Power Sector
2.2c Consumption for Electricity Generation: Commercial and Industrial Sectors

IV. Electric Power Surveys and Publications

Summary of Key Changes

EIA previously presented data on electric power, such as generation and fuel consumption, in the following categories:

- Electric utilities,
- Nonutility power producers (independent power producers and combined-heat-and power plants),
- Electric power industry (sum of electric utilities and nonutility power producers).

Now EIA is presenting data for the following new categories:

- Electricity-only-plants
- Combined-heat-and-power (CHP) plants,
- U.S. power producers (sum of electricity-only plants and CHP plants and equal to the prior "electric power industry" category).

Data on electricity-only plants are disaggregated for utilities and independent power producers, as there are customers who are interested in maintaining this distinction. Data on CHP plants are disaggregated by the end-use category (commercial, industrial, electric power) they report as their major line of business. The categorization is based on their North American Industrial Classification System code. For example, a CHP plant that is part of a hospital will be classified as "commercial." Similarly, a CHP plant that reports that it is part of a paper mill will be classified as "industrial," and a plant that reports that its primary business is selling power to others will be classified as "electric power."

In addition, EIA has estimated and is presenting data on the amount of fuel used to generate electricity and the amount of fuel used for useful thermal output. Furthermore, during the course of recategorizing the data, EIA performed a thorough data quality review and revised data to resolve anomalies.

Efforts to Improve Data

EIA reviewed electric power-data from 1989 through 2001 to determine whether there were anomalies. The 1989–2000 data for nonutilities were from Form EIA-860B, "Annual Electric Generator Report-Nonutility," and its predecessor, Form EIA-867, "Annual Nonutility Power Producer Report." The 2001 data are from Form EIA-906, "Power Plant Report." These forms collect data on fuel consumption, generation, and, with the exception of 1995 through 1997, useful thermal output. When anomalies were identified in the data for the more recent years (1998–2001), EIA contacted selected respondents to resolve the inconsistencies. For the historical data it was not possible to contact respondents. In this situation EIA made data adjustments to resolve the anomalies.

EIA reviewed data for facilities with heat rates greater than 40,000 Btu per kilowatthour and less than 5,500 Btu per kilowatthour. The upper limit was chosen to allow for the heat rates of older non-electricity boilers. In addition, EIA reviewed data for facilities with overall efficiency of greater than 100 percent and identified facilities with thermal output that were not designated as CHP plants. To ensure consistency, EIA compared North American Industry Classification System (NAICS) codes, cogenerator status, fuel consumption, electric generation, and thermal output levels over time. Moreover, EIA analysts also reviewed and evaluated aggregate-level data by State, NAICS code, fuel type, and generator type. For the historical data (1989–1997), EIA also:

- Estimated a value for useful thermal output for 1995 through 1997 (when useful thermal output was not included on the survey form) that produced a heat rate between 5,500 and

40,000 Btu per kilowatthour and an efficiency rate consistent with that observed in other years (see discussion below on CHP fuel use methodology).
- Corrected errors in units reported for fuel consumption.
- Compared data on fuel consumption with data on electric generation and adjusted data on fuel consumption or generation to maintain a consistent ratio.
- Adjusted data on useful thermal output for those respondents with heat rates outside the 5,500-to-40,000 Btu per kilowatthour range and an efficiency rate consistent with other years.

The review included an examination of both respondent-level data and aggregate-level data. For the 1998-2000 data, the review also included a comparison for consistency with data reported by manufacturing plants on Form EIA-3, "Quarterly Coal Consumption—Manufacturing Plants," since a subset of the EIA-3 manufacturing plants generate electricity and also reported on the electric generator survey Form EIA-860B. In general, there was good correspondence between the data submissions. In situations where there were inconsistencies, selected respondents were contacted to explain the differences. The analysis revealed that in some instances there were legitimate explanations for high percentage differences, such as a respondent reporting data for a facility on one survey that should not be included in the other survey.

For 2001, EIA determined that the monthly submissions for a substantial number of facilities were not of high enough quality. For those facilities in question and for all of the facilities that submit data only on an annual basis, EIA substituted that facility's 2000 data submission for total fuel consumption, electricity generation, and useful thermal output to obtain estimates for *AER 2001*. EIA is in the process of reviewing and revising these submissions for release at a later date.

Allocating CHP Fuel Use

Because respondents do not keep records on how much fuel a CHP plant uses exclusively to produce electricity, EIA developed the following method for estimating how the total fuel consumed in the boiler is split between electricity generation and useful thermal output:
- First, a steam boiler efficiency rate of 80 percent was assumed[10]
- Then the reported or estimated value for useful thermal output (in Btu) was divided by 0.8 to estimate the fuel used to generate this amount of thermal output.
- Next, this value was subtracted from total fuel consumption and the remainder was assumed to be the amount used for electric generation.

Electric Power Publication Tables Affected

In both the *Electric Power Monthly* and the *Electric Power Annual*:

- Data will be shown for the following categories throughout most of the report: (1) U.S. power producers, (2) electricity-only plants, and (3) CHP plants (commercial, industrial,

[10] Arthur D. Little, Report to the Energy Information Administration, *Industrial Model: Update on Energy Use and Industrial Characteristics*, (September 2001), Appendix C, "Average Boiler Efficiencies."

and electric power). Data on fuel consumption are shown for both electric generation and thermal output.
- The lowest level of aggregation is at the State level.
- Data on petroleum coke are converted to barrels and included in petroleum consumption and stocks tables.
- Fuel types are revised to be consistent with the *Annual Energy Review*.

V. Natural Gas Surveys and Publications

Summary of Key Changes

A number of changes have been made to natural gas consumption data presentations, definitions, and data sources. As a result of these changes the presentation of natural gas consumption by end-use sector will be consistent with end-use sector presentations and definitions in other EIA publications and the measures of natural gas used by electricity generators will be explicitly presented and identical to the quantities presented in electric power publications.

In prior EIA data publications natural gas consumption was presented for residential, commercial, industrial, transportation, and electric utility sectors. Deliveries of natural gas to independent power producers (called "other nonutility power producers" on the survey form) were included in the data reported for the industrial sector and the measures were collected through natural gas survey forms submitted by gas delivery agents (local distribution companies and pipelines).

Beginning with *Annual Energy Review (AER) 2001*, the definition of industrial sector gas consumption for 1993-2001 no longer includes independent power producers. In addition, a new electric power sector is being used which includes independent power producers, utilities, and other electricity generators as described in the previous electricity discussion. The data reported for the electric power sector are derived entirely from data submitted on electricity data collection forms used over the period 1993-2001. These include Forms EIA-759, "Monthly Power Plant Report" and EIA-860B, "Annual Electric Generator Report-Nonutility" through 2000 and Form EIA-906, "Power Plant Report" for 2001.

Compared with past publications, the impact of the definitional change for the industrial sector is to reduce measured natural gas consumption by the industrial sector. For example, in *AER 2000* EIA showed 9.39 trillion cubic feet delivered to industrial facilities in 2000. In *AER 2001*, the comparable figure (under the "other industrial" heading) for 2000 is 8.25 trillion cubic feet. This change is a result of the change in the operational definition of deliveries to the industrial sector.

Compared with past publications, the impact of the definitional change and the new data sources for the electric power sector is to increase measured natural gas consumption compared to the previous electric utility data series. As a result of the changes in data sources (predominantly new electric power data sources), total natural gas consumption is higher than previously published; i.e., total natural gas consumption has increased by 5, 3, and 3 percent in 1998, 1999, and 2000, respectively.

Also beginning with the publication of *AER 2001* and following with the *Natural Gas Annual*, new detail is available about gas consumption in the commercial, industrial and electric power sectors that distinguishes deliveries of natural gas to combined-heat-and-power (CHP) plants in these sectors from deliveries to other facilities within these sectors. "Deliveries to industrial consumers" includes deliveries to industrial consumers that are CHP plants, such as paper mills, as well as other industrial users. Included with the CHP plant data are a small number of industrial firms that report using natural gas only to generate electricity (most likely for their own use). "Deliveries to commercial consumers" also include deliveries to CHP plants, such as hospitals. Similarly, a small number of plants that report natural gas use for only electricity generation are included with the data on commercial CHP plants.

The sources for total commercial and industrial sector data are natural gas survey forms while the sources of the subcomponent CHP data series are electric power survey forms. The sources of all electric power data series, including the CHP subcomponent, are electric power survey forms.

Publication Elements Affected

- Deliveries to industrial consumers
- Deliveries to industrial consumers for the account of others
- Deliveries to electric utilities (deleted)
- Total deliveries to consumers
- Total consumption
- Balancing item
- Deliveries to electric generators (new element)
- Average price for natural gas delivered to industrial consumers
- Number of industrial consumers
- Average annual consumption per industrial consumer

Publication Tables Affected

Changes affect 64 of the 83 tables in the *Natural Gas Annual.*

- National-level tables (Tables 1, 26, B1, B2)
- State-level or State-detail tables (Tables 2, 15, 16, 18, 21, 23, 27, A2)
- Summary Statistics by State (Tables 29-79)

VI. Coal Survey and Publications

Summary of Key Changes

Data on coal consumed by the commercial and industrial sectors will now be separated into coal consumed by combined-heat-and-power (CHP) plants and coal consumed by the other plants in the commercial and industrial sector (referred to as other or "non-CHP").[11] Consumption by electric utilities and independent power producers, shown separately in the past, will be combined and called "electric power sector." Coal consumed by the electric power sector will be subdivided into coal consumed solely for power generation ("electricity-only plants") and coal used at CHP plants. Note that "independent power producers" were previously called "other power producers" in the coal publications and tabulations. Both terms refer to the same entities, i.e., generating facilities with a North American Industrial Classification System (NAICS) code of 22.

Coal Consumption Data Sources

The sources for total coal consumption remain unchanged for the residential and commercial sectors and for coke plants. They are:

- Residential and Commercial–Form EIA-6A, "Coal Distribution Report."
- Coke–Form EIA-5, "Coke Plant Report."

For the industrial sector excluding coke plants (referred to as "other industrial,") the data sources remain the same for the following categories:

- Manufacturing–Form EIA-3, "Quarterly Coal Consumption—Manufacturing Plants."
- Mines–Form EIA-7A, "Coal Production Report."
- Agriculture, Mining, Construction, and Transportation–Form EIA-6A, "Coal Distribution Report."

For the portion of coal consumed by CHP plants in the commercial and industrial sectors through 2000, data were obtained from Form EIA-860B, "Annual Electric Generator Report-Nonutility" and beginning in 2001, Form EIA-906, "Power Plant Report."

Data for the electric power sector for the years 1989 through 2000 were from Form EIA-759 and Form EIA-860B. Beginning in 2001, data from Form EIA-906 will be used.

[11] A small number of commercial and industrial plants that use coal only to generate electricity are included with the data on commercial and industrial CHP plants.

VII. Petroleum Surveys and Publications

Summary of Key Changes

Data on sales to independent power producers (that may have been previously reported in the industrial sector) are now included in the sales for electric power generation category in the "adjusted sales" tables of the *Fuel Oil and Kerosene Sales Report*, Tables 13-24. This category includes data on electric utilities and data on independent power producers. The data on electric utilities are obtained from Form EIA-759, "Monthly Power Plant Report," and FERC Form 423, "Monthly Report of Cost and Quality of Fuels for Electric Plants." The data on independent power producers are from Form EIA-860B, "Annual Electric Generator Report-Nonutility" through 2000, and Form EIA-906, "Power Plant Report" for 2001. Previously, some data on sales of kerosene, distillate, and residual fuel oils to independent power producers were obtained from Form EIA-821 survey, "Fuel Oil and Kerosene Sales Report" but coverage may not have been complete or data for independent power producers may have been included in the end-use sectors.

Publication Tables Affected

Data on sales by end-use sector are published in the *Fuel Oil and Kerosene Sales Report.* Data appear in two sets of tables. Tables 1-12 publish the results of the EIA-821 survey, except for on-highway diesel and kerosene. For on-highway diesel, State-level estimates are obtained from the Federal Highway Administration.

In Tables 13-24 (Adjusted Sales), estimates of distillate fuel oil are adjusted at the Petroleum Administration for Defense (PAD) district level to equal published *Petroleum Supply Annual (PSA)* volume estimates of products supplied. On-highway diesel State-level sales are calculated from Federal Highway Administration data.

Residual fuel oil volumes in Tables 13-24 are adjusted at the national level to equal published *PSA* products supplied estimates.

Kerosene volumes in Tables 1-24 are adjusted at the national level to equal *PSA* products supplied volumes.

Electric power generation data are also replaced in the Adjusted Sales tables (Tables 13-24). National-level distillate and residual fuel oil sales are calculated from annual aggregations of data collected on Forms EIA-759 and EIA-860B. The consumption data are added to the stock change of light and heavy oils to obtain the estimates of sales. Allocations at the State level are based on the EIA-821 survey.

VIII. Renewable Energy Publications

Summary of Key Changes

For the first time EIA is presenting data on biomass energy consumption that were obtained by aggregating individual power plant data for nonutilities rather than by applying a generalized heat rate to the aggregate net generation figure. All new renewable energy publications also reflect changes in EIA definitions of the energy use sectors described earlier.

Publication Tables Affected

The main changes occur in estimates of renewable energy consumption and outputs found in the *Renewable Energy Annual*'s Executive Summary, Chapter 1, and Appendix C.

Detailed Table Changes for the *Renewable Energy Annual*

Throughout the tables, estimates of biomass consumption are based on the new methodology described earlier and result in significant revisions. Where energy use sectors are presented, information reflects the new definitions.

Table presentations remain the same for Table H1 in the Executive Summary and Tables 1 and 5 in Chapter 1. Changes to the other tables are as follows:

Table 2. Renewable Energy Consumption by Energy Use Sector and Energy Source, 1997-2001

- Commercial sector now includes energy consumption for electric-only power plants and combined-heat-and-power (CHP) plants. Previously, this was included as a small fraction of the industrial sector's consumption.
- Industrial sector energy consumption no longer includes commercial sector or independent power producers' consumption.
- Electric utility sector is changed to electric power sector and now includes consumption for electric utilities and independent power producers combined.

Table 3. Renewable Energy Consumption for Electricity Generation by Energy Use Sector and Energy Source, 1997-2001

- Commercial sector is added for the first time. Previously, commercial sector energy consumption was included as a small fraction of industrial.
- Industrial sector energy consumption no longer includes consumption by the commercial sector or independent power producers.
- Electric utility sector is changed to electric power sector and now includes information for electric utility and independent power producers combined. Previously, independent power producers' consumption was included in industrial.
- Electric power industry is changed to total, which is the sum of the commercial, industrial, and electric power sectors.

Table 4. Electricity Net Generation from Renewable Energy by Energy Use Sector and Energy Source, 1997-2001

- Generation is reorganized into three new sectors: commercial, industrial, and electric power.
- Commercial sector includes generation by nonutilities whose primary purpose of business is commercial.
- Industrial sector includes generation by nonutilities whose primary purpose of business is industrial.
- Electric power sector includes generation by electric utilities and nonutilities that are independent power producers.
- Total by energy source is the sum of the commercial, industrial and electric power sectors.

Table 6. Renewable Energy Consumption of Nonelectric use by Energy Use Sector and Energy Source, 1997-2001

- Commercial sector now includes energy consumption for useful thermal output at combined-heat-and-power plants. Previously this was included as a small fraction of the industrial sector's consumption.
- Industrial sector energy consumption no longer includes commercial sector or independent power producers' consumption.
- Electric power sector now includes consumption for electric utilities and independent power producer combined.

Table 7. Biomass Energy Consumption by Energy Source and Energy Use Sector, 1997-2001

- Electric power sector includes wood energy consumption by electric utilities and independent power producers that were previously included in the industrial sector.
- Distributions of biomass energy consumption by Census Region are no longer included.

Table 8. Industrial Biomass Energy Consumption and Electricity Net Generation by Primary Purpose of Business, 2000

- New table that presents detailed characteristics of industrial biomass consumption.

Table 9. Waste Energy Consumption by Type and Energy Use Sector, 2000

- New table that presents detailed information on waste consumption excluding wood waste.

Appendix B

Table B1 is a new table presenting historical renewable energy consumption for 1989 to 2001. It reflects the changes described for Table 2 above.

Appendix C

Throughout Appendix C, information on electricity generation and net summer capacity by State, which was previously provided in separate tables for electric utilities and nonutilities, is now provided in separate tables for the electric power sector, which includes electric utilities and independent power producers, and for the commercial and industrial sectors combined.

IX. Greenhouse Gas Emissions Publication

Summary of Key Changes

The EIA report *Emissions of Greenhouse Gases in the United States* assigns all energy-consumption-related carbon dioxide emissions to one of four end-use sectors: residential, commercial, industrial and transportation. A sector's emissions consist of the fuels directly burned in that sector (e.g., natural gas consumed to heat homes) as well as a share of the emissions resulting from electricity generation. Previously, emissions from nonutility generators were all assigned to the industrial sector, even though some of those emissions were based on electricity that was sold into the electricity grid and consumed in the residential and commercial sectors. Only emissions attributable to conventional electric utilities were shared out to the end-use sectors. Beginning with the 2002 publication on greenhouse gas emissions, emissions attributable to the electric power sector (which includes entities other than utilities) will be shared out to the end-use sectors. The electric power sector includes electricity-only plants (utilities and independent power producers) and combined-heat-and-power plants who are primarily in the business of selling electricity.

Evolution of Presentation of Emissions Data

In the 2000 report a table was created that measured emissions based on electricity generation in the industrial sector and traditional electric utility emissions. Emissions from the two sources were summed to provide EIA's customers with a more complete total. However, in the end-use sector tables only the electric utility emissions were shared out. This created some confusion for EIA customers who could not add the electricity totals across sectors and arrive at the value in the stand-alone table.

In the 2001 report a table was created that presented an emissions total for both utility and nonutility generators. Unlike the previous year, this was not a stand-alone table, and the value from this table was shared out to the four end-use sectors. Because none of EIA's other multi-fuel publications allocated energy consumption in quite this same way there was somewhat of a disconnect created by this method as EIA customers could not re-create these emission values based on energy consumption in the multi-fuel, integrated publications.

For the 2002 report and beyond, the electric power sector will consist of emissions based on the multi-fuel, integrated publications that, beginning with the *Annual Energy Review* (AER), include plants whose primary business is to sell electricity (North American Industrial

Classification System--NAICS--code 22). The consumption tables (e.g., *AER* Table 6.5 for natural gas) include a small amount of thermal energy produced by NAICS 22 CHP plants. In assigning emissions to end-use sectors, all of the emissions related to fuel consumed for electricity only or CHP plants remain in the commercial and industrial sector unless they are categorized as being primarily in the business of selling electricity (NAICS 22) in which case they are included in the electric power sector as indicated above.

The electric power sector's emissions are shared out to the end-use sectors as determined by *AER* Table 8.5. Because the end-use categories in Table 8.5 differ slightly from the four detailed above in that there is an "Other" category rather than "Transportation," an alteration is made to the data. A small amount of the "Other" category is estimated to be Transportation (4 to 6 billion kilowatthours). The rest of the "Other" category's electricity sales are allocated to the "Commercial Sector." Likewise, because there are no data to separate the "Direct Use" category, it is all allocated to the "Industrial Sector."